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THE HANDLING, STORAGE AND TRANSPORT OF BULL SEMEN*

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In giving this short paper on such a wide subject I have endeavoured to cover the system of handling, storage and transport of semen as carried out at this centre. No doubt the methods described will differ from those used by others and I hope will stimulate discussion. I have introduced items which in my limited reading have come my way and seem of interest in this discussion.

HANDLING

At the Hoddom centre an endeavour is made to maintain the semen at a temperature of 35° C. from the time of collection until dilution is completed. It is felt that temperature change can have more serious effects on undiluted semen than when it is diluted.

Maintenance at 35° C. is accomplished by using warm collecting tubes insulated during use and placed in an incubator immediately on coming into the laboratory, where it remains for the short time necessary to make a microscopic examination of a sample. Dilution is made as quickly as possible, the diluter having been raised to 35° in a water bath.

After dilution the semen is at once divided up into test tubes; 15 c.c. test tubes are used for storage and transmission to sub-centres. The smallest tubes for the anticipated demand on that particular semen are used, tubes being filled to capacity.

It is considered that breaking the diluted semen into small volumes to aid rapid cooling is desirable at this stage.

STORAGE

Storage at the Hoddom centre is in the usual manner, the tubes of semen being held in a refrigerator at 5° C.

The principles behind the effectiveness of this method of storage would appear to be twofold.

1. Because of the low temperature the spermatozoa lie dormant, exhibiting little or no movement and thus conserving their energy potential.

2. Even though strict cleanliness is observed in collecting, bacterial contamination of semen is always present to a greater or lesser degree. Storage of the diluted semen at 5° C. greatly reduces the proliferation of these bacteria and therefore limits the production and effects of their toxins, thus decreasing the adverse effect their activity and that of the spermatozoa would have on the *p*H if held at a higher temperature.

With this method of storage an effective period of use of three days is generally possible. It is considered, however, that the majority of bulls cannot be collected from more frequently than every six days. This position, where service from a particular bull is available only for three days in six, is unsatisfactory to many potential clients among pedigree breeders. Lengthening of the storage period up to six days with maintenance of the conception rate at a reasonable level would be a tremendous advance.

The use of antibiotics as adjuvants to the diluted semen has become common practice. At Hoddom 0·3 per cent. sulphanilamide has been added for 12 months; for the first six months of that period an improvement of a little over 7 per cent. has been experienced over the previous year's conception rate figure.

Recent work in America and this country indicates that the addition of penicillin and streptomycin, either singly or together, gives beneficial results. Have any of the members of the Society present tried inseminations beyond three-day-old semen, and were the conception rates reasonably maintained when penicillin and/or streptomycin were added? A promising approach to this problem of prolonging the storage period is that of using low temperatures—in the neighbourhood of –79° C. (Smith & Polge, 1950). Perhaps, in to-day's discussion, we will hear how this work is progressing.

Another field in which improved and prolonged storage may be made possible is in the development of new diluters. Diluters containing whole egg or reduced proportions of yolk seem to be cheaper but little if any better than the present diluter (Dunn *et al.*, 1950). Various synthetic diluters, using dried egg, have been evolved and despite initial success appear to have fallen into disrepute.

The addition of small amounts of glucose to egg yolk-citrate diluter has been shown to increase and prolong the active motility of spermatozoa (Lardy & Phillips, 1942; Salisbury & Van Demark, 1945). Several workers report that a high electrolyte concentration is deleterious to spermatozoa (Bogart & Mayer, 1950; Dubincik, 1934; Milovanov, 1934).

Kampschmidt and his co-workers have combined these last two factors. They found that a reduction in the sodium ion buffer salts (either citrate or phosphate) and their replacement in the diluter with sugar solutions, particularly glucose and fructose, was beneficial (Kampschmidt *et al.*, 1951). However, reduction of the sodium ions rendered maintenance of an optimum *p*H level difficult over a long storage period. The addition of sodium bicarbonate, which is not readily ionised, overcame this difficulty (Henle & Zittle, 1942; Lardy, Hansen & Phillips, 1945; Moore & Mayer, 1950). The diluter which gave the best results in their study (Kampschmidt *et al.*, 1951) consisted of one part egg yolk and five parts of an isosmotic mixture of one part sodium bicarbonate solution (1·3 per cent.) plus four parts glucose solution (5 per cent.).

TRANSPORT

There are some basic factors which apply to all forms of transport of semen.

* This paper and the four that follow were given at the meeting of the Society for the Study of Animal Breeding, at the Wellcome Research Institute, London, October 12th, 1951.

1, An adequate supply of ice must be ensured to last throughout the journey, particularly in hot weather. Insulation to some degree is necessary and may involve using thermos jars for long journeys.

It is preferable to use balloons filled with water and frozen rather than loose ice, as the latter, when thawing, wets the tube and can easily pull the semen temperature down too low.

2. Tubes should be filled to capacity, a smaller tube being used whenever possible in preference to half filling a large tube.

Prince and Almquist (1948) reported on this matter, observing that incomplete filling, particularly when the tubes are agitated, has a harmful effect on the survival of the spermatozoa. They considered this may possibly be due to the effects of oxygen in the partly filled tubes.

Transport of semen from the Hoddom centre falls into three categories.

1. To other centres.
2. To sub-centres.
3. By inseminators on rounds in centre area.

1. *Transport to Other Centres.*—This has always been made by train. For a fairly long period semen was dispatched to another centre by rail, the semen being about 16 hours in transit overnight. In this case the semen was packed with ice balloons in a wide-mouthed vacuum jar, all air space in the jar being eliminated with cellulose wadding. The jar was packed into a wicker hamper.

2. *Transport to Sub-Centres.*—In the D.C.B.A. transport is relatively simple, involving a car journey of approximately 25 minutes and then a 40 minutes' bus journey to either of the sub-centres. For this purpose the tubes of semen are wrapped in cellulose wadding with a balloon of ice and packed in a cardboard container.

3. *Transport of Semen by Inseminators.*—Inseminators at Hoddom and its sub-centres carry their semen in a quart wide-mouthed vacuum jar ; the tubes are wrapped in a layer of cellulose wadding with a balloon of ice. The vacuum flask is carried separately from the other inseminating equipment ; tool clips are fitted under the dashboard of the car to which the handle of the flask is attached. This minimises jolting and vibration of the flask and its contents and is a most convenient method of carrying the flask in a car.

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II.—By H. J. CEMBROWICZ,

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Handling

The principles of handling semen at an A.I. centre should be based on physiological findings. Judging, however, from the similar results obtained in A.I. practice at the various centres, using different methods in dealing with semen, one comes to the conclusion that there exists a certain range (maximum and minimum) in semen biological characteristics. Certain early data accepted *a priori* as factual were proved later by experiment and research to be false. It is difficult, therefore, to lay down strict rules for handling semen and one must always be prepared to try new and improved methods. With this in mind, it is considered best to describe briefly the routine work at the Ilminster centre, where one can say in favour of techniques used there that results have been uniform and, one would add, satisfactory (conception rates in the region of 70 per cent.) for the last three years. The chief principles laid down at this centre are as follow :—

(1) Cleanliness at collection.

(2) Maintenance of proper temperature by means of :—

(*a*) Protection of previously warmed collecting tube with a woollen glove to prevent too sudden cooling.

(*b*) Speedy transference of the semen to the laboratory where temperature is maintained above 20° C.

(*c*) Dilution immediately after examination with buffer at the same temperature (the buffer having been taken from storage at 4° C. and warmed to the appropriate temperature).

(3) Sterilisation of all glassware used (including holding it over Bunsen burner flame immediately before use).

(4) Consistency of method in order to make possible future comparative experiments.

Storage

Semen is kept in the refrigerator at a temperature of between 4° and 6° C. As the temperature varies in different parts of the refrigerator a special part of it is chosen for semen storage, as far as possible where the temperature is nearest to that stated above. Semen brought back from the field is discarded and a fresh batch distributed to the inseminators from stored semen. A temperature chart is kept, recording the temperature of the refrigerator twice daily.

Stored semen is used up to the fifth day, depending on requirements and popularity of a particular bull. A proportion of semen from special bulls is diluted in the ratio of one to five of buffer and used until his next collection, which usually takes place within a week. In this way we are now finding the answer to the question of nominated services in a limited way, and conception rates are fairly satisfactory.

Semen is examined daily and checked for motility. The results obtained with stored semen were in some cases rather unsatisfactory, being 7 per cent. lower on the second day of semen usage. There were slight variations between breeds and an even larger variation between bulls.

Transport

Even in the early days of A.I., inseminations were carried out successfully with semen which had travelled long distances ; in 1934 ram semen sent by 'plane from this

country to Poland was used with success ; in 1937 bull semen was exchanged between this country and Holland and calves were produced recently in Italy with semen sent from the U.S.A. All this, of course, was largely experimental.

Nowadays, with the great technical advance made in A.I., and with semen being dispatched regularly from every producing centre, we are much concerned with the *degree* of success obtained with the use of transported semen. One's opinion will not be isolated if it is stated that generally less satisfactory results are obtained with semen transported over long distances. Although semen is transported in some cases up to 50 miles and delivered by special courier, bus, or rail, there is no significant difference in the conception rate between that of the Ilminster main centre and the sub-centres.

However, semen sent to another centre (only 60 miles away) by rail produces a conception rate 10 per cent. lower than the sending centre. One has to take into consideration in such cases that at the receiving centre semen is one day older and in use one day longer. When analysing results, one must also take into account the unequal number of animals involved.

The principles to be observed in the transport of semen are : (1) speed ; (2) maintenance of constant low temperature by the ample provision of ice ; and (3) complete filling of semen test tubes in order to avoid agitation.

In the routine work of dispatching semen to sub-centres from the main centre semen is packed at room temperature in containers or thermos flasks with ice balloons. By the time it arrives at its destination the temperature is found to be between 4° and 6° C. The precooling of semen in a refrigerator prior to packing in containers, also precooled, would of course be more satisfactory, but presents practical difficulties which still require surmounting.

Semen dispatched over longer distances (400 miles) did not give too satisfactory a result ; but the transport in this case took two days, and the whole operation was carried out beyond the control of the centre. For the future, however, it should be borne in mind that much will depend on the successful transport of semen over long distances if a nominated service from special bulls is to be given.

From available literature the impression is obtained that in the U.S.A. transport of semen over long distances is more satisfactory than in this country, probably because of the use of walk-in cold rooms for packing material, and because a better type of container is in use, while rail facilities are better and transport by air is more highly developed.

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III.—By J. P. FRAPPELL, M.R.C.V.S.,
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Many changes in routine techniques have followed the commercial development of artificial insemination in this country. New information which is constantly coming to light has resulted in modifications of methods which were practised almost generally only a few years ago. One of the noteworthy changes has been the use on most centres of semen for one day only, or for two days in the case of the minority breeds. This is achieved by many centres collecting semen in the early morning and dispatching it direct to sub-centres by various methods of transportation, so that it may be available for use on the same day. The saving of time in the collection, dilution and handling of semen is therefore of increased importance.

Nevertheless, the basic principles of semen handling technique continue to apply, but there is reason to believe that these are not generally observed. Much of the handling of semen is undertaken by lay personnel whose knowledge of semen physiology is usually limited and so it is the duty of veterinarians in A.I. to ensure that these principles are understood and practised regularly. During the various processes of handling, storing and transporting the main object should be the preservation of the maximum number of spermatozoa capable of fertilisation.

Handling

Temperature control plays a major part in the handling of semen, the most vital period being prior to dilution, when there is a risk of cold-temperature shock. Precautions must be taken at early morning collections when atmospheric temperatures are especially low. Often during the winter when collections are being made in the bull barn or outside, temperatures are below freezing point or the semen has to be protected from cold winds.

To reduce the risk of temperature shock at the time of collection, the collection tube should never be cold or, during wintry weather, exposed to the atmosphere. The easiest way to pre-warm the tube is to hold it under a running hot-water tap for a few seconds and then cover it with a muff made from a suitable insulating material which should not be so heavy as to pull the tube and cone on the A.V. into a vertical position, thus preventing ejaculation of the semen directly into the tube. The muff should be made from cheap and easily replaceable materials so that they can be renewed frequently to reduce the risk of transmitting infection.

The practice of obtaining more than one sample before the first has been taken into the laboratory is to be deprecated ; each sample should be conveyed to the laboratory with the minimum of delay. To prevent rapid cooling of raw semen samples before dilution and to ensure that all equipment, tubes, etc., are kept at an equable temperature, the air temperature in the laboratory should be maintained as nearly as possible at 20° C.

At the Gloucester centre, the practice is to examine each sample microscopically for density and motility immediately it is received in the laboratory. It is then diluted with two parts extender at 20° C. Portions for further examination should be removed before dilution and placed in a water bath at 25° C. The partially diluted semen is allowed to stand for five minutes at laboratory temperature before being fully diluted to the extent required, with extender at 20° C. After standing for a further five minutes, the fully diluted sample is agitated gently and divided into tubes as required.

There is no evidence to show that there are any adverse effects on spermatozoa as a result of rapid cooling after dilution ; on the contrary, such cooling may have a beneficial effect in that bacterial multiplication and sperm metabolism are reduced more quickly. Therefore it is the practice at this centre to place the tubes of diluted semen into the refrigerator immediately after the semen has been divided.

When examining bulls for test purposes on farms, proper temperature control of semen samples is more difficult to achieve than in the laboratory owing to the danger of the earlier samples becoming exposed to cold winds, etc., while sampling is still in progress. As a result the semen may be completely shocked by the time it is examined. The possibility of devising mobile equipment for this purpose—comprising a warm stage, and possibly water bath, operated by a car battery—might be considered, but in any case the raw

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samples should be stood in flasks of warm water while awaiting examination.

Storage

When using egg-yolk buffer extenders, all semen should be stored in tubes rather than flasks to reduce aeration of the samples. To maintain a more constant temperature the refrigerator in which the samples are stored should be reserved exclusively for this purpose and so the need for opening it for the removal of ice cubes, eggs and other items is avoided.

Transport

With the development of artificial insemination in this country, the importance of efficient transport of semen has increased considerably.

1. Larger A.I. organisations have resulted in the dispatch of semen over increased distances.

2. As a result of the concentration of minority breeds into fewer and larger units, more inseminations with these breeds are undertaken with exported semen than are carried out at the exporting centre.

3. An important factor is that, consequent upon the growth of centre groups, more inseminations are carried out from the sub-centres than from the main centres.

The main features in the efficient transport of semen are temperature control and reduction of agitation of the semen samples. Suitable methods of packing by the dispatching centre can ensure temperature control, but unless the semen is handled throughout by insemination personnel the second problem is not so readily overcome. When public transport and postal services are employed the only practical safeguard is to see that the semen containers are filled completely.

The thermos jar is obviously the theoretical ideal for maintaining a low temperature over a long period. Its disadvantages are, however, high initial cost and fragility.

Thermos jars in suitable containers provide the best means of conveying fairly large quantities of semen to sub-centres from their parent main centres and are conveniently accommodated in car, bus or train. The turn-round of empty containers is easy and, where public transport services are used, the comparatively short distances involved reduce the risk of excessive handling and consequent breakages. For the transport of smaller quantities over longer distances, the normal type of cardboard box and ice balloons provide a perfectly adequate and satisfactory container. The cost of the container and packing materials is low and they have a long service life. In addition, the freightage rates are reasonable and the breakage risk, compared with that of the thermos jar, is very small. This container has been criticised by many people, but provided the method of packing is correct, a low temperature can be maintained satisfactorily. This conclusion was confirmed by the following observations.

Tubes used in the experiment contained 25 c.c. of normal extender without semen, and were packed at a temperature of approximately 15° C. in the ordinary standard oblong cardboard box. Squares of cellulose wadding 24 by 24 by $\frac{1}{4}$ inches were used to pack the tube of extender and the balloon of ice in the container. Immediately after packing the container was placed in a circulating stream of air at a temperature of 35° to 40° C. for three hours. After that it was kept in normal air at a temperature of 20° C. until opened at 12 and 24 hours after packing respectively. The packages were therefore exposed to temperatures which would not be experienced in this country apart from very hot summer weather. It was apparent from the outset that the insulating properties of the boxes and packing were not as good as had been believed, but were adequate for the overnight transport of semen.

To ensure effective temperature control it is essential that the tubes of diluted semen are in direct contact with the ice balloons. Separation of the tube from the balloons by wadding resulted in a considerable rise in the temperature of the semen over that of the water-ice mixture of the balloons. It would also appear strongly advisable to use more than one balloon of ice, even though the total weight of ice is not thereby increased, and the ideal would be to use three balloons approximately 1 inch in diameter and 6 inches long, packed to provide a complete barrier against outside atmospheric temperature.

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SEMEN DILUTION RATES IN RELATION TO HANDLING TECHNIQUE

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This contribution is based on field trials carried out at the Reading Cattle Breeding Centre as the results obtained have considerable bearing on the subject under discussion. Before proceeding further, it is perhaps advisable to recall that the primary object of artificial insemination was to use the semen from the superior sire over the maximum number of cows. Salisbury, Beck, Cupps and Elliott (1943) had appreciated the fact that, consequent on the improvements in semen handling, storage technique and the types of diluents used, more attention would require to be directed to increasing the actual rates of dilution. Subsequent publications by Salisbury, Elliott and Van Demark (1946, 1948) and Willett (1950) showed that dilutions up to a level of 1 : 100 could be safely practised without any appreciable drop in fertility, but there are no publications showing that these high dilution rates are being used as a routine either in the U.S.A. or in this country. This apparent reluctance to use high dilutions led to the carrying out of two controlled fertility trials at Reading, where firstly a 1 : 20 dilution was compared with a 1 : 50, and secondly a 1 : 50 with a 1 : 100 dilution rate. These investigations were done on a split sample basis and the general procedure was similar to that adopted at Reading for other field trials, details of which have already been published. (See Stewart, Melrose & Wilson, 1951.)

A report of the first trial was given by Stewart (1950). In this only semen samples of good motility from bulls of known high fertility were used and the results are summarised in Table I. A conception rate of 62·6 per cent. was obtained in both groups but it is also noted that a drop in conception rate of approximately 9 per cent. occurred in both the 1 : 20 and 1 : 50 dilutions from the second to the fourth day. Since a similar drop occurred in both groups it could not be attributed to the increased dilution rate.

Table I

Day of use	1 : 20 dilution		1 : 50 dilution	
	Number of first inseminations	% Non-returns after 16 weeks	Number of first inseminations	% Non-returns after 16 weeks
Second day ...	1,409	67·1	1,173	65·7
Third day	1,336	59·7	1,022	63·5
Fourth day ...	534	58·4	366	56·3
	3,279	62·67	2,561	62·67

The second trial, comparing a 1 : 50 with 1 : 100 dilution rate, was similar to the above except that the citrate diluent contained 1,000 mg. per ml. of streptomycin calcium chloride complex. This trial was run on the bulls in routine use and included one bull of doubtful fertility and one recently purchased yearling bull of unknown fertility. The results are given in Table II, and submission of these to the chi square test showed that the differences were not significant.

TABLE II

Day of use	1 : 50 dilution		1 : 100 dilution	
	Number of first inseminations	% Non-returns after 16 weeks	Number of first inseminations	% Non-returns after 16 weeks
First day	678	69·6	752	68·6
Second day ...	734	65·5	728	62·9
Third day	705	58·7	760	58·8
	2,117	64·6	2,240	63·4

The drop in conception rate from the first to the third day of approximately 10 per cent. was higher than anticipated, and this is being investigated. No sperm counts were done on the semen samples at the time of dilution, but in the latter half of the trial density estimations were made on each sample used in the field. These showed that the sperm counts varied from 760 to 1,460 millions per ml., which is equivalent to a range of 7·6 to 14·6 million spermatozoa per insemination at the 1 : 100 dilution rate.

These field trials support the view that provided the methods adopted are carefully controlled, and the use of low fertility bulls avoided, the high dilution and the use of stored semen will not affect the conception rate materially. During a period between these trials there was a reduction in the conception rate at the Reading centre and the dilution rate was suspected, since many of the samples were then being diluted at the 1 : 50 level. However, a study of the records showed there was a fall in conception rate of all bulls irrespective of the dilution rate used. After a close investigation of the routine methods employed in handling the semen, it was decided to make the following changes in technique :—

(1) The temperature of the buffer at time of dilution was kept at 19° to 21° C. and not 37° C. as previously. This allowed the diluted semen to be cooled in a shorter time.

(2) A larger quantity of ice (approximately 9 oz.) was carried in each operator's flask (4-pint size).

(3) Operators were forbidden to use semen that had been carried round the farms on previous days. To assist in this the bulk semen is now dispatched to the sub-centres in test tubes labelled for use on first, second and third days.

Although no controlled investigation was carried out to check the effect of these alterations, the conception rate during the six weeks subsequent to the change showed an increase of 10 per cent. over that for the preceding six weeks. (See Table III.)

TABLE III

Period	Number of first inseminations	% Non-returns after 16 weeks
August 1st to September 8th, 1949	1,062	56·2
September 13th to October 31st, 1949 ...	1,448	66·2

The foregoing investigations showed that provided the technical procedures are adequate and the bulls are of good fertility, a satisfactory conception rate can be obtained with semen diluted as a routine at 1 : 100. This use of semen at high dilution rates over a period of three days has been adopted at Reading as it reduces the number of bulls required and in addition provides a service more popular to the farmers.

At present there is a tendency for some centres to use semen for one day only. This undoubtedly gives a slightly higher conception rate but it also increases the number of bulls required at the centre. May not this policy of using semen for one day only be considered a retrograde step in the technical development of artificial insemination ? During the discussion on genetics and animal breeding at the 1951 National Veterinary Medical Association Congress it was said that in certain areas a farmer owning 20 cows can have anything up to 12 bulls used for their insemination. This was considered to be an undesirable state of affairs and emphasis was laid on the fact that more attention will require to be paid to a constructive breeding policy for the herds of small farmers. This can be aided by limiting the number of bulls used in each herd. If artificial insemination is to progress in the future, steps will need to be taken to ensure that the widest possible use can be made of the sires that are proven to be of outstanding merit.

In conclusion, it is emphasised that although the general need for a careful control of all artificial insemination methods has always been appreciated, many of the supposedly minor details can become of considerable importance when overlooked. This is particularly so when high dilution rates and stored semen are being used.

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TEMPERATURE TESTING OF TRANSIT CONTAINERS FOR BULL SEMEN

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INTRODUCTION

These experiments were designed in an endeavour to find the most efficient method of maintaining semen at a suitable storage temperature during transit.

Various methods of packing semen for transport are in use. In all of them the principle is the same—*i.e.*, to maintain the vessel containing diluted semen in contact with ice and insulating against heat-gain by various means. The method in vogue in this country for centre to centre shipment is to use a balloon filled with ice enclosed in cotton-waste or wood-shavings in a cardboard carton. The efficiency of this type of container varies with the weight of ice used, the ambient temperature and the quantity and position in the pack of the semen transported. Generally, it can be stated to be efficient in cold or cool weather for journeys lasting up to 24 hours and inefficient in warm or hot weather.

(1) Observations on Temperatures of Tubes of Semen Received at Bromsgrove during the months of May, June and July, 1949, packed in cardboard box of cotton-waste and ice balloon.

The temperatures of 30 samples were recorded. They ranged from 7·0° to 19·5° C., with a mean of 10·5° C. All samples had been in transit about 24 hours.

(2) Tests Carried Out using Vacuum Flasks

For these tests wide-mouthed vacuum flasks of approximately 750 c.c. capacity were used. In each test the flask was suspended by means of two rubber diaphragms in a corrugated cardboard carton which was, in turn, enclosed in a zip-fastened rexine cover.

Various methods of filling the interior of the flask were investigated, and also alternative methods of sealing the mouth.

In each test the method was to insert thermocouples at required points within the flask in conjunction with temperature recorders. A further thermocouple was attached to the outside of each rexine cover. By this means a continuous record of the temperature within the flask and of the ambient temperature was obtained. The tests were carried out in a thermostatically controlled chamber at various ambient temperatures.

It was decided to compare the efficiencies of the various packs on the basis of the length of time that each could maintain the temperature between zero and + 8° C.

(a) Tests on the Efficiency of the Vacuum Flask Itself

The rises in temperature inside vacuum flasks filled in various ways were recorded in a chamber maintaining an ambient temperature of 20° C.

1. The flask was filled with oil and sealed with a sponge rubber bung and metal snap-on cap.
2. Flask filled with ice cubes and sealed as in (1) above.
3. Flask filled with crushed ice with thermocouple in tube of oil in the centre. Sealing was as in (1) and (2) above.
4. Flask filled as in (3) above but sealed by means of a cork and elastic-band.

The results were as given in Table I below.

(b) Tests of Efficiencies of Various Methods of Suspending Vessels of Fluid within the Flasks.

Firstly, tests were carried out with a test tube of oil placed vertically in the flask embedded in the centre of a rubber sponge soaked in water. A comparison was made between soaking the sponge in water, squeezing lightly and then freezing and following the same procedure but without squeezing. The average results of three tests in each group are given in Table II.

The next tests were carried out using a flat bottle of the tablet marketing type. The bottle was filled with oil, a thermocouple inserted, and it was placed at the bottom of the flask immediately above a hollow sponge rubber container filled with water and frozen. The remainder of the flask was filled with flat rubber containers, each containing about 50 c.c. of ice.

Further tests were carried out with two bottles placed one above the other, the second one replacing one of the ice pads. The results are given in Table III.

The two readings given at the bottom of columns 6 and 7 show the times applicable to the higher and lower bottles in the flask respectively. No marked difference between the two at the ambient of 20° C. was recorded.

In an endeavour to overcome the heat-gain through the mouth of the flask, experiments were carried out using an exhausted glass bung in place of the rubber or cork. The results are shown in Table IV.

Similar tests to those described above were applied to the Danish type of semen pack. Firstly, the temperature holding properties of the complete pack were investigated and then the rubber ice container was taken from the pack and placed in a vacuum flask. Table V shows the average results of three tests with each method.

Conclusion

The popular method of transporting semen with a balloon of ice in a cardboard box could not be relied upon in summertime to maintain a temperature below 8° C. for as long as 24 hours.

It was observed during the course of the experiments described above that there was no appreciable variation in the efficiency of "Thermos" vacuum flasks. It was shown that crushed ice was superior to ice cubes in that the temperature change was less irregular and slower, probably on account of the greater weight of ice that could be packed into the flask in this form. It was established that cork was superior to foam rubber for use as a bung for vacuum flasks.

The rest of the experiments have served to demonstrate, as would be expected, that the temperature holding capacity of a semen pack depends upon two main factors : the amount of ice that could be packed and the insulating powers of the container. The importance of insulation was nowhere better demonstrated than in the comparison between the performance of the Danish pack in its metal container and in a vacuum flask (Table V).

Table III shows to what extent the ambient temperature can influence the rate of temperature rise inside a vacuum container.

Table I

Description of equipment		Ambient temperature	Time to fall to 0° C.	Time at 0° C.	Time between 0° and 8° C.	Useful life
Filling	Sealing of flask					
Flask filled with oil at −2° C.	Rubber sponge bung and metal cap	20° C.	Initial temperature, −2° C.	Nil	7 hours	7 hours
Flask filled with ice cubes	Ditto	20° C.	Initial temperature, −2° C.	Irregular rise		25 hours
Flask filled with crushed ice. Thermocouple in tube of oil	Ditto	20° C.	Initial temperature, −1° C.	31 hours	13 hours	44 hours
Flask filled with crushed ice. Thermocouple in tube of oil	Cork bung	20° C.	Initial temperature, 0° C.	46 hours	36 hours	82 hours

TABLE II

Description of equipment		Ambient temperature	Time to fall to 0° C.	Time at 0° C.	Time between 0° and 8° C.	Useful life
Filling	Sealing of flask					
Test tube of oil in centre of sponge soaked in water, squeezed lightly and frozen	Rubber sponge bung and cap	20° C.	Initial temperature, 0° C.	Nil	2 hours	2 hours
Test tube of oil in centre of sponge soaked in water and frozen without squeezing	Ditto	20° C.	Initial temperature, 0° C.	4 hours	9½ hours	13½ hours

TABLE III

Description of equipment		Ambient temperature	Time to fall to 0° C.	Time at 0° C.	Time between 0° and 8° C.	Useful life
Filling	Sealing of flask					
One flat bottle and four ice pads	Rubber bung and cap	20° C.	1 hour	30 hours	20 hours	51 hours
One flat bottle and four ice pads	Ditto	40° C.	2 hours	3 hours	15 hours	25 hours
Two flat bottles and three ice pads	Ditto	20° C.	5 hours	21 hours	12 hours	38 hours
Two flat bottles and three ice pads	Ditto	40° C.	5 hours	Nil	14½ hours 16 hours	19½ hours 21 hours

TABLE IV

Description of equipment		Ambient temperature	Time to fall to 0° C.	Time at 0° C.	Time between 0° and 8° C.	Useful life
Filling	Sealing of flask					
		20° C.	Initial temperature, 0° C.	42 hours	25 hours	67 hours
One flat bottle and four ice pads	Exhausted hollow glass bung	40° C.	6 hours	20 hours	4 hours	30 hours
		−40° C.	1 hour	22 hours	Nil	23 hours

TABLE V

Description of equipment		Ambient temperature	Time to fall to 0° C.	Time at 0° C.	Time between 0° and 8° C.	Useful life
Filling	Sealing of flask					
Complete Danish container containing tube of oil	—	17° C.	1 hour	1 hour	3 hours	5 hours
Rubber ice container from Danish container containing tube of oil and placed in vacuum flask	Rubber bung and metal cap	20° C.	1 hour	32 hours	35 hours	68 hours

The use of large quantities of ice inside vacuum flasks whilst in transit is limited by the tendency to break the flask from within due to shock during handling in the post or on rail. The same applies to the possible use of a vacuum bung.

It has been found that by using the method of packing flat bottles between layers of rubber ice pads and sealing the flasks with foam rubber bungs, the temperature can be maintained below 8° C. for 50 hours with a minimum of breakages in transit.

PIG RECORDING AND PROGENY TESTING

"Pig recording and progeny testing on a national scale ought to have been operating years ago, Mr. G. R. H. Bishop told a conference of pig producers at Darlington last week," says *The Farmers' Weekly* in its issue of February 15th, adding: "Sir James Scott Watson replied that plans had been laid for testing stations to be set up on a national scale. There was, however, little likelihood of these being established at present.

"The question of a balancer meal for pigs was also raised at the conference, and it was promised that the matter would be brought to the notice of the Ministry of Food."

CLINICAL COMMUNICATION

REPORTS ON THE REPAIR OF THE ELBOW AND RADIUS IN THE DOG

PETER J. DALTON, M.R.C.V.S.,
SALISBURY

A report on the treatment of fracture of the olecranon process of the ulna by means of pinning indicates that although the end results are satisfactory, the repair process may be tardy (Weipers, 1951a). Similarly, repair of fractures of the humerus causing separation of the condyles may be effected by a screw transversing the condyle (Weipers, 1951b), but it is difficult to ensure correct apposition of the separated condyle and the shaft.

Fracture of the Olecranon Process of the Ulna

The most common site of fracture of this bone is through the semilunar notch, just above the level of the articular surface of the radius.

An adult spaniel which suffered such a fracture showed that traction by the powerful triceps muscles had caused gross separation and rotation of the olecranon.

Repair was effected by means of a Harvey Pierce No. 8 stainless steel plate, screwed to the slightly convex lateral surface of the olecranon.

The operation consisted of :—

(1) Exposure of the fracture site by means of

(*a*) A skin incision, 4 to 5 inches in length, over the lateral aspect of the elbow, extending well above and below the joint.

(*b*) Exposure of the ulnaris lateralis and deep head of the flexor carpii ulnaris muscles ; retraction of these muscles and separation of the muscles attached to the lateral aspect of the olecranon to obtain a site on the bone to which the plate could be attached. This involves danger of penetration of the joint and strict asepsis is essential.

(2) Apposition of the fractured ends and attachment of the plate.

(3) Covering the plate (especially the screw heads) by suture of the tensor fasciae.

(4) Closure of the skin incision.

Remarks.—It is essential that the bones be held immobile in their correct position whilst all four holes are drilled and the screws inserted.

An orthopaedic surgeon of my acquaintance has made the somewhat " heroic " suggestion that a tourniquet of thin rubber tubing at about the level of the upper third of the humerus can be kept in position by means of a sterile skewer through the belly of the triceps, but haemorrhage is usually slight.

It is advantageous to bend the plate slightly so that it fits the convexity of the bone.

Fracture of the Lateral Condyle of the Humerus

A three-and-a-half-month-old Labrador pup suffered a fracture through the lateral condyloid crest.

Exposure of the fracture was by means of a similar skin incision and incision and reflection of the muscles which are attached to the lateral epicondyle.

Reduction of the fracture was carried out and a $2\frac{1}{4}$-inch screw was inserted so that it ran up through the condyloid crest, diagonally across the medulla of the humerus and into the medial cortex.

The head of the screw was covered by muscles.

Remarks.—In cases of repair of the elbow the use of pins, etc., has been to obtain correct apposition of the fractured bones, while immobilisation is obtained by plaster casts which must include the chest. The leg is set in slight flexion, so that when the animal is standing the paw is just clear of the ground. It may be argued that such a plaster alone would be sufficient, but in the past it has been found that some limitation of the joint movement has occurred by this method, whereas none has occurred when fixation of the fracture ends has been accomplished.

The administration of curare (Tubarine) immediately before reduction and fixation is commenced (the animal having been given nembutal in order to prepare the fracture site) has proved of immense value. A relaxation of muscles is obtained which would otherwise necessitate a depth of anaesthesia very near the maximum. Used in conjunction with pentothal, curare assists greatly in the reduction of dislocations.

The parental use of penicillin is commenced only on the day of operation and is continued for four or five days, and as yet it has been found unnecessary to administer it as a " cover " for several pre-operative days.

Intramedullary Pins Left *in situ*

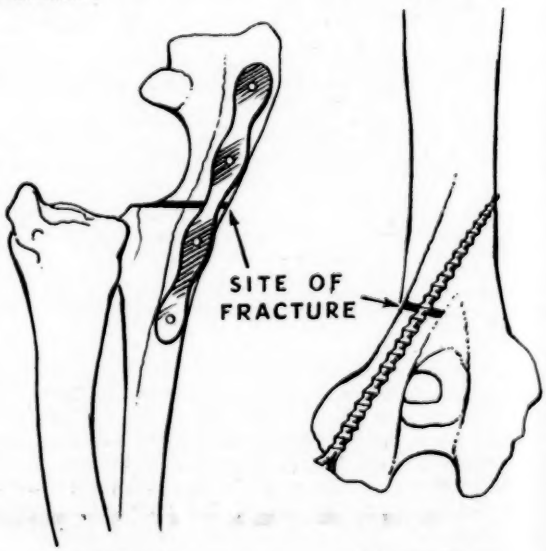
In 1949 a 65-lb. Boxer dog suffered fractures of both forelegs when it jumped from a high, flat roof.

The animal would not tolerate the application of plaster casts for more than a few days at a time and as no stainless steel plates were to hand it was decided to insert short lengths of intramedullary pins into the cavity of the radii to obtain correct apposition of the bone ends, so that when the dog removed its plasters it might not cause displacement of the fracture before another support could be applied.

The pins were inserted with some difficulty due to (1) their excessive length and diameter ($\frac{3}{4}$-inch long pins would have been better than the $1\frac{1}{2}$-inch ones we used) ; (2) the difficulty of manoeuvring the distal portion of the bone over

(*Concluded at top of col. 1, page 129*)

It is regretted that the original skiagraphs of these cases are not of sufficient quality to warrant reproduction but an attempt has been made to sketch the bones with their methods of fixation.



the end of the pin projecting from the proximal medulla. (The use of a muscle relaxant (curare) would have facilitated this portion of the operation.)

Light plaster casts, and several types of splints, were applied, and although the dog removed them with monotonous regularity it was found that displacement of the fracture ends did not occur, and another type of support could be applied which would be tolerated for a few more days.

Locomotion was resumed by the dog in about seven days and recovery was uneventful although it was some six months before the animal could walk for more than a mile or so. The owner now informs me that it is difficult to detect the fracture and that normal locomotion has returned. The owner has been posted to the Air Ministry in London and if any member with radiographic facilities would undertake to X-ray this animal to ascertain what has occurred in the two years during which the pins have been in the medullae, I would be extremely grateful.

Acknowledgments.—I would like to express my gratitude to Mr. R. E. Earnshaw, M.R.C.V.S., for sending along the ulnar fracture case, and to Dr. T. Price and Dr. J. Shields, of the Bath and Salisbury orthopaedic units respectively, for the help and encouragement they have given.

REFERENCE

WEIPERS, W. L. (1951a, b.) *Vet. Rec.* **63.** 662.

QUESTIONS AND ANSWERS*

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work, but must be of a general nature—questions cannot be considered in which information is sought regarding diagnosis or treatment of specific cases, nor for which solely a private reply is desired. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

The Agglutination Test

Q. 408.—*Is the agglutination test ("Wooldridge's Encyclopaedia," Vol. I, p. 108) still recognised as being of value as a diagnostic procedure? Is this test carried out at College Laboratories and Ministry Investigation Departments?*

A.—The agglutination test is a valuable diagnostic procedure in many diseases. It is assumed that the question refers to the agglutination test for brucellosis. In this disease the test is a valuable and reliable means of diagnosis. After a large infective dose it becomes positive within 7 to 14 days and reaches a peak at about three weeks. If the animal receives a small dose, however, the incubation period may be prolonged and, in some cases, *e.g.*, when an animal becomes infected with a small dose during pregnancy, the test may not become positive until after she has aborted or calved. In these cases, although the test is completely negative at the time of abortion or calving, the titre usually rises within two to three days and becomes definitely positive within a week; several such cases may occur in the same herd, presumably because the same factors are operating. (The so-called "blocking" or "incomplete" antibodies may be concerned; with the consequence that, as can be shown by special tests, the bacteria in the test suspension are sensitised—first phase of agglutination—but do not agglutinate—second phase—and the result therefore appears negative.)

The agglutination test for brucellosis is standardised in this country and is carried out in College Laboratories and at all Ministry Veterinary Investigation Centres. Certain commercial laboratories also adopt the standardised test.

. . . . . .

"Good Hind Legs" in Cattle

Q. 409.—*Some cattle breeders stress the necessity for good hind legs. I would like to know:—*

(a) If this refers to straightness of the leg as judged by the angle of the hock, or

(b) Is related to absence of lameness or other trouble which may arise from various causes in the hoof or joints, etc.

(c) Also, how much of this is due to heredity?

(d) How much to environment?

(e) If a bull is rejected for licensing, either for private use or for A.I. because of "bad hind legs," has the owner any redress?

A.—"Good hind legs" in cattle implies straightness of both hock and stifle joints with good feet and pasterns. The hind cannon bone must be perpendicular and the hocks placed sufficiently far forward to avoid soiling during defaecation. The limbs must be carried forward during walking in a line with the body and should remain parallel at all times.

(*b*) No; excepting that lameness and foot troubles may be secondary to bad conformation.

(*c*) A great deal.

(*d*) In young bulls, badly housed and insufficiently exercised, environment may play a part but in old bulls, kept under such conditions, weakness and even deformity of the limbs may result.

(*e*) The acid test is in the progeny. If young bulls, properly housed and treated, have good hind legs, it is fairly certain that the sire, if unsound in this respect, has developed the fault as a result of management. The condition is so readily passed on by a defective sire that it is very important when selecting bulls for A.I. to ensure that the animal is sound in this respect. An owner would have no redress if a bull lacking "good hind legs" were rejected, except that he can appeal to the Ministry of Agriculture against the decision.

. . . . . .

Interdigital Cysts*

Q. 410.—*What is the cause of interdigital cysts in dogs? Is there any reliable treatment to prevent recurrence?*

A.—Although many theories have been evolved as to the aetiology of these cysts, not one of them can stand the test of close scrutiny. It has to be admitted, therefore, that we do not know the cause, and the condition remains one which needs organised investigation. The bulging painful lesion which appears between any two toes cannot always be properly described as a cyst, since in many instances it takes on the characters of an abscess. Thus the cause has been thought to be infection by germs (streptococci, staphylococci, *B. coli*), although it was not known how they gained access to the tissues. Autogenous vaccines prepared from the organisms found, have sometimes seemed to be effective, and at others have failed completely. The same has been true of the use of mixed stock vaccines. Microbial infection might be accepted as the cause if one foot was affected, but that theory is not so acceptable when perhaps all the feet are involved.

Some practitioners have reported finding tar pellets, stones, sand, or barley awns inside the swellings and have regarded these foreign bodies as the direct cause of abscesses. But a far greater number of interdigital swellings have been found devoid not only of foreign body but also of germs. Sporting breeds of dogs were at one time thought to be the chief

*** We would draw the attention of our readers, for their future guidance, to the requirement now indicated at the head of this section, that questions must be of a general nature and not enquiring as to the diagnosis and treatment of specific cases.**

* Supplementing reply to question in *Vet. Rec.*, Vol. **56**, No. 31, page 278 (July 29th, 1944).

sufferers, but all breeds may be affected ; cats never. Some years ago the respondent knew of a Pekinese spaniel which was a martyr to interdigital cysts, all four feet being implicated, either singly or collectively, over a period of years. Every known method of treatment was tried (including, of course, surgical excision) and an apparent cure was achieved only after administering a course of mixed vitamins. The dog had no more cysts up to the day it died of old age six months later. The same treatment tried in subsequent cases seemed to be successful in a few and failed in others.

Therapeutic measures which may be tried are :—

1. Hot fomentations, or poultices, and allowing the cyst to rupture. Quite often healing takes place and there is no recurrence.

2. Surgical excision of a portion of the cyst wall, evacuation of the contents and cauterisation of the lining membrane. Performed under local anaesthesia, this is probably the most effective and the quickest treatment.

3. Injection of stock or autogenous vaccines.

4. Penicillin injections when the cysts are not sterile.

5. Administration of tin preparations such as Stannoxyl, or sodium cacodylate ; or graphite as recommended by Professor McCunn.

* * * * *

Correspondence

"*Poultry Case for Diagnosis.*"

Sir,—The condition of the pullet described in Question No. 406 is not as uncommon as is suggested by your respondent. During the course of routine diagnosis at Weybridge we encounter this condition several times every year. Although the symptoms are so striking and several fowls showing the condition are sometimes found in the same flock, recovery usually takes place in from 24 to 48 hours. On several occasions affected birds have been sent to us alive and although they were showing advanced symptoms on dispatch from the farm, recovery had taken place during transit and a perfectly normal fowl arrived at the laboratory.

The symptoms of this peculiar condition do resemble in some respects those of limberneck or botulism in fowls, and occasionally those of Newcastle disease. Differential diagnosis, however, seldom presents any real difficulty because neither of these diseases is likely to be confined to individual fowls in a flock. On some occasions we have encountered this condition in birds in batteries and agree with your respondent that the symptoms might be ascribed to a hypersensitivity to light. On the other hand, the same condition also occurs under quite different types of management.

The fact that recovery seems to be permanent rules out the possibility that the condition might be due to cerebral haemorrhages, etc. We have not carried out a detailed histo-pathological examination of these cases except when recovery has *not* taken place, thus indicating that the symptoms were caused by some condition other than the one under discussion. Histological examination of the brain and cord of such fowls has occasionally established lymphomatosis as being the cause of partial paralysis of the neck muscles with a variable degree of twisting of the neck.

In our reports referring to this undiagnosed condition we describe it as a temporary nervous disorder of unknown origin affecting certain of the brain centres in the cerebellum and medulla. The condition has been referred to in the poultry lay Press as "tremors," but the use of this term is apt to lead to confusion with the infectious virus disease affecting baby chicks and described in America as "epidemic tremor." We therefore prefer not to use this term.—Yours faithfully, J. D. Blaxland, Ministry of Agriculture and Fisheries, Veterinary Laboratory, New Haw, Weybridge, Surrey. *February 11th*, 1952.

Attempts had been made in some quarters to create controversy about the respective merits of organic manures and fertilisers. It had been claimed by some advocates of organic manures that fertilisers poisoned the soil and were injurious to the health of plants, animals, and human beings. There was no sound evidence to support these views. The merits of organic manures were fully appreciated by farmers and agricultural scientists, but fertilisers were also required, and without them there would be world famine.—Sir William Ogg.

ABSTRACTS

Phenothiazine in the Control of Trichostrongylosis in Sheep*

This paper deals with experiments to find out the effect of daily 1-gramme doses of phenothiazine on the rate of acquisition of infestation and on the worm burden of lambs kept at a constant rate of artificial infestation with *Trichostrongylus axei*. This daily dose of the drug, when given to lambs within a few minutes of a dose of infective worm larvae, reduced the number of larvae that developed to maturity but when the interval between the doses of the drug and of the larvae was several hours there was no effect upon the establishment of the larvae in the animal. Sheep continuously exposed to infestation were not protected against the development of severe parasitic gastritis when there was an interval of several hours between administration of the drug and the consumption of the larvae. The daily 1-gramme doses of phenothiazine had no effect in reducing the number of mature worms in sheep but they prevented the development of infective larvae from eggs passed in the faeces and had inconstant effects on the egg counts. It is suggested that the good results reported from the use of phenothiazine-salt mixture in the field may be due to the inhibition of larval development in the faeces and a consequent reduction in the pasture larval count and not to an actual reduction in the worm burden. On this account medicated salt licks could usefully be applied to control parasitic gastritis where lambs and ewes run together because the lambs would be exposed to a much lower pasture infection ; adult sheep, already infected, would be unlikely to benefit from such treatment.

J. N. O.

* **Observations on the Value of Small Daily Doses of Phenothiazine for the Control of Trichostrongylosis in Sheep.** Gibson, T. E. (1950.) *J. comp. Path.* **60.** 117-132.

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Cobalt Metabolism Studies with Sheep*

The association of cobalt with rumen function is widely accepted as is the fact that cobalt given *per os* is much more effective in relieving deficiency symptoms than when given parenterally. Some small response, however, is claimed for the latter and in an attempt to explain this the authors undertook a study of cobalt metabolism in sheep using the radio-activated element.

Each of three cobalt-deficient sheep were injected intravenously with 25 grammes of labelled cobalt (sulphate), giving a total activity in each case of 500 microcuries. These were killed at 12, 18 and 24 hours respectively and all tissues together with the contents of the rumen, abomasum, small and large intestine, faeces and urine, after appropriate treatment, were carefully examined for the presence of cobalt activity.

Two further sheep were fed similarly labelled cobalt (carbonate). One was given a single dose of 10 grammes (activity = 200 microcuries) the other 20 grammes (activity = 400 microcuries). Samples of blood, urine and faeces were examined periodically in the course of the following 48 hours.

The results, on the whole, whilst they substantiate those of previous workers, indicating that the bulk of cobalt injected intravenously is rapidly excreted from the body via the bile and urine, also show that small amounts pass into the rumen, possibly by regurgitation from the small intestine. It is considered possible that in this way repeated injections of cobalt over a long period may give rise to slow recovery in deficient sheep. These results show, too, that cobalt can be

* **Cobalt Metabolism Studies with Sheep.** Keener, H. A., *et al.* (1951.) *J. Anim. Sci.* **10.** 428-433.

absorbed from the intestinal tract into the blood stream in appreciable quantities. W. T. R.

* * * * *

Response of Cobalt-deficient Lambs to Liver Extract and Vitamin B_{12}*

The authors, having shown previously that the subcutaneous injection of an anti-pernicious-anaemia liver extract resulted in a positive curative effect in cobalt-deficient sheep, set out to determine the particular factor involved.

Using a total of 25 cobalt-deficient lambs, including adequate controls, samples of nine suitably fractionated liver extracts were injected subcutaneously twice weekly for two weeks. Results were assessed on the basis of improved appetites, live weight gains and increased haemoglobin content. On these grounds the authors show that the liver factor involved is vitamin B_{12} and that in doses of 150 μg. or more it is effective in the treatment of cobalt-deficient sheep. It is tentatively concluded from this that cobalt has as one of its functions the production of vitamin B_{12} in the rumen of sheep, probably by microbial synthesis, and that cobalt deficiency is at least in part a vitamin B_{12} deficiency. [It is equally conceivable that cobalt is an essential growth factor for certain rumenal flora concerned with the synthesis of vitamin B_{12}.—*Abstractor.*] W. T. R.

* **The Response of Cobalt Deficient Lambs to Liver Extract and Vitamin B_{12}.** Smith, Sedgwick E., Koch, Berl A., & Turk, K. L. (1951.) *J. Nutrit.* **44.** No. 3.

REPORT

[**Department of Agriculture, Canada**: Report of the Veterinary Director-General for the year ended March 31st, 1951.]

This report is divided into two main sections, namely, the Contagious Diseases Section, and the Meat and Canned Foods Section.

Contagious Diseases Section

The report reveals that the profession in Canada faces many of the problems well known to us in this country, particularly that of man-power in the Federal and Provincial Services. It is interesting to note the peculiar difficulty which has arisen in these services owing to loss of men of some standing during the last few years, leaving few persons suitable to fill the more responsible posts, many of which are now held by men near or over retiring age.

As in this country, foot-and-mouth disease heads the list in spite of the fact that Canada has been free from this scourge for some years, but the increase of trade with Central and South America, where the disease is endemic, and the rapidity of modern transport are a constant source of concern to those responsible for maintaining the country free from disease.

It is particularly praiseworthy to note that the sound methods of sanitary policing employed have kept the country free from swine fever since 1946, in spite of the very high incidence of this disease in the United States. Rabies would appear to occur only in certain areas of the North-West Territories, where total eradication is rendered particularly difficult owing to the large numbers of wild fauna. However, the compulsory inoculation of all available sled dogs has reduced the incidence to a very low level. The disease has not appeared in any of the other provinces since 1946.

Scrapie first appeared in Canada in 1945–46, and regular inspections are made in certain areas, but no new cases have been seen for some years. Sheep scab likewise seems to have been eliminated and the country kept clear of dourine, glanders, contagious pleuropneumonia and rinderpest. Outbreaks of cattle mange have appeared and one or two cases of horse mange. Anthrax has appeared only once during the last year. Steady progress has been made in the eradication of brucellosis and tuberculosis, but much remains to be done. It is particularly interesting to note that under the tuberculosis eradication scheme reactors are slaughtered and compensation paid, and one is extremely surprised to learn that the results of the *post-mortem* examinations of these condemned reactors show that some 31·2 per cent. fail to show any lesions on *post-mortem* examination. It would be most interesting to learn the comparable figures in this country, were they available.

Newcastle disease has proved somewhat troublesome, particularly in British Columbia, but the policy of quarantine and slaughter, and the compulsory inoculation of in-contact flocks appears to be bringing the condition gradually under control. Fowl pest and fowl typhoid do not seem to cause undue concern.

The Department has also been responsible for regulations regarding the feeding of swill, very similar to our own; for the inspection and disinfection of livestock cars and railway trucks, and for the licensing for import of veterinary biologics and semen.

The report contains numerous tables and appendices giving statistical details of the work done.

Meat and Canned Foods Section

It is pleasing to note that in Canada, as in most civilised countries of the world, the veterinarian is accorded his proper place in the protection of the public in the matter of meat inspection. Statistical tables are given showing the slaughterings and condemnations in the different slaughterhouses right back to 1939 and also details of diseases and conditions found at inspected establishments during the year under review. Briefly, the work of this section can be found in the third paragraph of this report, namely:—

"The Meat and Canned Foods Section was engaged chiefly in (1) the veterinary examination of food-producing animals, including *ante-mortem* inspection of cattle, swine, sheep, goats, horses and poultry to eliminate those found to be affected with disease or other unwholesome conditions; (2) a thorough veterinary *post-mortem* examination of each carcase at time of slaughter to detect and eliminate diseased and otherwise unfit meat; (3) destruction for food purposes of all diseased, unsound, or otherwise unwholesome meat or meat by-product; (4) constant supervision of the preparation of meat and meat food products to ensure cleanliness and wholesomeness during their preparation into articles of food; (5) guarding against the use of harmful preservatives and other deleterious ingredients; (6) supervision of the application of the Inspection Legend to meat and meat food products to show that they are 'Canada Approved'; (7) informative labelling and prevention of the use of false and deceptive labelling on meat and meat food products; (8) veterinary certification of meat and meat food products for export; (9) inspection of meat and meat food products offered for importation into this country; (10) examination of meat and meat food products for compliance with specification requirements of the federal Meat Board and other governmental purchasing agents; and (11) such investigations as are necessary to ensure the accuracy and effectiveness of the inspection procedure." L. G. A.

Also received.—Report of the Los Angeles County Livestock Department, 1950–1951. (C. E. Wicktor, D.V.M.)

REVIEW

[Recent Advances in Bacteriology. Edited by J. H. Dible, M.B., F.R.C.P. Third Edition. (1951.) By J. D. MacLennan, M.B.E., M.D., with the assistance of Mary Barber, M.D. (Pp. 325.) London: J. & A. Churchill, Ltd., 104, Gloucester Place, London, W.1. Price 25s.]

The first edition of this book was published over 20 years ago and the emphasis in bacteriology has changed during the years. The field of endeavour on the border-line of laboratory procedure and clinical medicine has yielded to more fundamental studies and it is now more fashionable to discuss the physiology, nutrition, and the morphology of bacteria. Their appearance and behaviour under laboratory conditions have achieved greater prominence and this is reflected in the text and admitted in the preface. Viruses and the conditions they cause are not included for it is thought that these now form a branch of biology in their own right.

The first chapter describes the concepts of bacterial morphology now revealed by newer techniques and the momentum of the biochemical attack on microbiology is indicated by the latest information about the physiology, nutrition and the principles of chemotherapy found in other chapters. Those on antibiotics show the same thought and outlook of the microbiologist towards bacterial and mould antagonisms and relationships. Six of the 16 chapters deal with these general matters and they form useful and valuable synopses of the advances made. Streptococci and staphylococci each receive separate consideration and four chapters are devoted to the Clostridium group and the diseases produced by its members. The antigenic analysis of *Bacterium coli*, the recent studies made on the dysentery group, and the "paracolon" bacilli are dealt with under the general heading of the Enterobacteriaceae; Salmonella are given little space because fundamental advances are discussed and classical studies, which are already well documented, are not elaborated.

One would expect that the contents of the book would be determined by what the author considered important and recent; this is sure to lead to some criticism but he could have been consistent in the table of contents. Chapter headings such as the Enterobacteriaceae, the Streptococci and the Staphylococci imply that the main attention is focused on the bacteria whereas such headings as Diphtheria, the Anaerobic Diseases of Man and the Clostridial Diseases suggest that the host reaction is being emphasised. The book will serve a good purpose even though ill balanced—this is inevitable in a recent advances volume—and the veterinary bacteriologist will find the sections on fundamental microbiology profitable. The accounts of the specific infections will prove of less use as the veterinary aspects are meagre. The general chapters are suitable for all who are studying microbiology but those concerned with the diseases have a definite medical complexion.

A useful list of references is appended to each chapter.

Weekly Wisdom

He defined a gentleman as one who behaved himself, and hoped they still taught the young to be tolerant, respectful to their seniors, and kindly to their inferiors. When the world began to behave we might look forward to freedom, happiness, and a peaceful design for living.—Mr. Leslie Henson, proposing the toast of Emanuel (his old) School at a luncheon to celebrate the 350th anniversary of the granting of a charter by Queen Elizabeth to Emanuel Hospital, Westminster.

QUESTIONS IN PARLIAMENT

Foot-and-Mouth Disease

Mr. Crouch (February 21st) asked the Minister of Agriculture what evidence he has as to semen being a carrier of foot-and-mouth disease.

Sir T. Dugdale: I am advised that the virus of foot-and-mouth disease invades all the tissues of an affected animal and that there is every reason to expect that the semen would be infected. There is, in fact, evidence of the recovery of virus from the semen of infected bulls in Holland.

Mr. Crouch: Is my right hon. and gallant Friend not aware that there is a good deal of alarm in agricultural circles in view of the fact that last winter there was a case of foot-and-mouth disease in an A.I. station?

Mr. Crouch asked the Minister of Agriculture if he will have an annual report of the research station at Pirbright published as was the custom in pre-war years.

Sir T. Dugdale: The Foot-and-Mouth Disease Research Institute was reconstituted on April 1st, 1951, under the Companies Act, 1948, as an independent research institute under the control of a governing body. The governing body has the question of publishing an annual report under consideration.

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Over-stocking: Milch Cattle (Marketing)

Lieut.-Colonel Sir T. Moore (February 21st) asked the Minister of Agriculture what steps have been taken by him to ensure that all milch cattle shall be milked out upon arrival at markets; and whether he will consider the desirability of making this condition obligatory in all markets.

Sir T. Dugdale: Officers of my Department have been instructed to use every opportunity to discourage the practice of exposing overstocked cows in markets; the co-operation of the N.F.U., the Breed Societies, market authorities and the Auctioneers' Institute has been sought; and Press notices have been issued from time to time. I have no power to require milch cattle to be milked out upon arrival at markets, but it is an offence under the Protection of Animals Acts to cause unnecessary suffering to an animal, and proceedings can be taken under those Acts where cruelty is caused as a result of overstocking.

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Dogs (Quarantine Regulations)

Lieut.-Colonel Sir T. Moore (February 21st) asked the Minister of Agriculture whether consideration can now be given to exempting from quarantine dogs brought to this country direct from Malta in view of the fact that there have been no cases of rabies in Malta for many years.

Sir T. Dugdale: No. There are several countries which claim to have been free from rabies for some years, but I am advised that if dogs from those countries were exempted from the quarantine requirements the opportunities for getting dogs illegally into this country would be greatly increased. Moreover experience has shown that even when dogs are brought direct from countries which are free from rabies it is impossible to avoid some risk that they will come into contact with other dogs or cats while in transit to this country.

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Nigeria Livestock Mission (Recommendation)

Mr. Hurd (February 20th) asked the Secretary of State for the Colonies if consideration of the recommendations of the Nigerian Livestock Mission has now been completed; and if he will state the decisions reached in agreement with the Nigerian Government.

The Secretary of State for the Colonies (Mr. Oliver Lyttelton): I have not yet received a considered statement of their views on this matter from the Nigerian Government, who have been heavily engaged with the recent constitutional changes. I do not expect to receive them for some time. The problems involved are so large that some delay must, I fear, be condoned.

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Sheep Worrying

Mr. Bossom (February 20th) asked the Minister of Agriculture if, in view of the fact that the equivalent of 500,000 1s. 6d. rations of meat was lost in Great Britain in 1951 due to the worrying of sheep by uncontrolled dogs, he will see that every opportunity is taken to prevent a repetition of this in the year 1952.

Mr. Nugent: As stated in reply to my hon. Friend the Member for Sevenoaks (Mr. J. Rodgers) on January 31st, my right hon. and

(*Concluded at top of col. 1, page 133*)

gallant Friend is considering whether he can introduce effective legislation that would help farmers with this difficult problem. My hon. Friend the Under-Secretary of State for Scotland and my right hon. Friend have arranged to discuss the matter with the National Farmers' Unions for England and Wales and Scotland early next week.

NOTES AND NEWS

Diary of Events

Mar. 5th.—Meeting of the South-East Midlands Division, B.V.A., at Northampton (The Plough Hotel), 2.30 p.m.

Mar. 6th.—Meeting of the Society of Practising Veterinary Surgeons (Division, B.V.A.) in the University of Glasgow Veterinary School, 2.30 p.m.

Mar. 6th.—Meeting of the Central Division, B.V.A., at the Royal Veterinary College, N.W.1, 6 p.m.

Mar. 7th.—Annual General Meeting of the South Wales Division, B.V.A., at Carmarthen (Dolwar Café), 2 p.m.

Mar. 7th.—Liverpool University Veterinary Society's Annual Ball, in the Students' Union, Bedford Street, 8 p.m.

Mar. 12th.—Meeting of the Technical Development Committee, B.V.A., at 36, Gordon Square, London, W.C.1, 10.30 a.m.

Mar. 12th.—Meetings of the Editorial Committee, B.V.A., at 36, Gordon Square, W.C.1, Executive 2 p.m., Main 3.30 p.m.

Mar. 20th.—Society of Women Veterinary Surgeons: Visit to The National Institute for Research in Dairying, Shinfield, Reading, 2.15 p.m.

Mar. 28th.—Yorkshire Division, B.V.A. Dinner-Dance at Leeds (Parkway Hotel).

April 29th, 30th, and May 1st.—Meetings of Council and Committees, B.V.A., in the Royal (Dick) School of Veterinary Studies, Edinburgh.

Sept. 8th—13th.—Seventieth Annual General Meeting and Congress of the British Veterinary Association, at Harrogate.

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PERSONAL

Appointment.—Mr. J. K. H. Wilde, M.Sc., B.Sc., M.R.C.V.S., A.R.C.S., Chief Veterinary Research Officer, Mpwapwa, Tanganyika, has been appointed Assistant Director of Laboratory Services, Nigeria. From to-day communications should be addressed to the Veterinary Research Laboratories, Vom, P.O. Bukuru, Northern Nigeria, West Africa.

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Births.—Briault.—On February 24th, 1952, at Minehead Hospital, to Pat, wife of Michael O'M. Briault, M.R.C.V.S., a daughter, Victoria Anne.

Hobbs.—On February 18th, 1952, at Redruth Hospital, Cornwall, to Dorothy (*née* Thomas), wife of Peter Hobbs, M.B.E., M.R.C.V.S., a son—Jonathan Charles Andrew.

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Marriages.—Goulstone—van der Vliet.—On February 6th, 1952, at Nederlandsche Herv Kerk, Amstelveen, Raymond Goulstone, M.R.C.V.S., The Oaks, Rowhedge, Colchester, to Wilhelmina van der Vliet, of Amstelveen, Holland.

McDonald—Glen.—On February 12th, 1952, Andrew McDonald, M.R.C.V.S., of The Flat, 1, King Henry's Road, Lewes, Sussex, to Jeanie, only daughter of Mr. and Mrs. W. Glen, of Comforts Place Farm, Lingfield, Surrey.

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Dr. John G. Campbell's Assignment with F.A.O.—In a message dated November 29th, 1951, which has just reached us, the F.A.O. Far East Regional Office announces that Dr. John G. Campbell, Ph.D., F.R.C.V.S., a veterinary expert specialising in diseases of poultry, arrived in Bangkok to assist the Thai Veterinary Department and the College of Agriculture at Bangkhen in the production of vaccine for the control of poultry diseases—in particular, Newcastle disease, fowl-pox and fowl-cholera, and to assist in the development of procedures required to diagnose and control poultry diseases.

Dr. Campbell, who went to Thailand under F.A.O.'s Technical Assistance Programme, is the second F.A.O. poultry expert to be sent to Thailand, the first being Dr. Fronda, an expert on poultry breeding who is at present stationed at the College of Agriculture at Bangkhen. Dr. Campbell, who graduated at Edinburgh in 1939, was to remain in Thailand for one year, having been granted leave of absence by the British Empire Cancer Campaign, with which organisation he holds a full-time research grant. His present address is: The Department of Livestock Development, Phya Thai, Bangkok, Thailand.

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R.C.V.S. OBITUARY

McLean, John Broadfoot, Glendohr, Chester Road, Malpas, Cheshire. Graduated Glasgow, April 1st, 1896. Died February 10th, 1952; aged 78 years.

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VICTORIA VETERINARY BENEVOLENT FUND

"In Memory of Mr. H. W. Steele-Bodger, M.R.C.V.S."

The Secretary of the Fund gratefully acknowledges the receipt of a donation from Mr. and Mrs. H. Raynor Hewetson.

Total received to date £23 12s.

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LEGAL NOTES

Successful R.C.V.S. Prosecution in the Midlands

Young Unregistered Practitioner Fined

A remarkable series of facts, some of which the Stipendiary, at all events, found to be "mitigating," underlay one of the cases most recently brought by the Royal College in pursuance of its efforts to protect the interests of the profession in every part of the country. It was heard at Sedgley, Staffordshire, where Peter Royston Guinness (26), of Hendon House, Gospel End, Sedgley, pleaded guilty to practising when not registered.

Mr. W. B. C. Forsyth, prosecuting for the Royal College, said that Guinness, who was neither on the register of the Royal College nor on the supplementary register, had carried out an operation for the sterilisation of a 12-month-old fox terrier bitch. The matter originated when Guinness had come to a Wolverhampton firm about the purchase of a car. When he was asked his occupation for the purpose of this matter he had replied "veterinary." A director of the firm had a fox terrier bitch and had considered having it sterilised, said Mr. Forsyth. Guinness undertook to do the job. A fee of 25s. was agreed. Guinness subsequently collected the animal but the day after he did so, there was a phone call. Guinness told the dog owner on the telephone that the animal had a disease known as hard pad and in the circumstances the operation could not yet be performed.

Guinness, said Mr. Forsyth, had stated that he was going to treat the animal with injections of streptomycin—a dangerous drug which should only be supplied to qualified persons. The dog owner was suspicious and, with one of his staff, went to Guinness's house, it was said. Guinness said that the dog was too ill to be seen. Then he admitted that it was dead. He was asked for the carcase and said it had already gone. Eventually he produced it. It was taken to a qualified veterinary surgeon who carried out a *post-mortem* examination. The operation had been done, but, said Mr. Forsyth, in a rather primitive way in that professional man's opinion. None of the normal pre-operative precautions had been taken and the dog had died from surgical shock. "The object of the Royal College in this prosecution is to protect animals who, unlike humans, have not the choice of the practitioner to whom they go, and to protect the public," added Mr. Forsyth.

Mr. Norman Carr, counsel for Guinness, said that the manner in which it was said that Guinness had carried out the operation was a matter of opinion. The charges did not refer to that. Guinness from the time he left school at 17 had wanted to go into veterinary service. For obvious reasons he could not get himself fully trained—but then this Act was not in being. He had gone about with another young man who had eventually become a qualified veterinary surgeon and had watched and learned from him. Through this association he had been asked to treat pets in a minor way.

The Veterinary Surgeons Act, 1948, gave the College power to put on a supplementary register people of 28 or more who, for seven years of the previous 10, had treated animals as the principal means of livelihood. Age disqualified Guinness. Correspondence in this matter had passed between Guinness and the College, and Guinness's M.P. had even intervened with the Minister of Agriculture, but the Act did not give the College any discretion which enabled them to admit him.

Guinness (said counsel) gave an undertaking not to practise—that would be itself an exceedingly severe punishment. He would lose his means of livelihood.

The Stipendiary said that, in view of the mitigating facts, he would take a lenient view of the matter. A fine of £5 was imposed, with £7 6s. special costs.

A.R.C. GRANTS FOR ANIMAL HEALTH TRUST POULTRY RESEARCH

The Animal Health Trust announces the award, by the Agricultural Research Council, of grants totalling approximately £6,000, for the year 1952, specifically in aid of the work being done at the Trust's Poultry Research Station at Houghton Grange, Houghton, Huntingdonshire. The immediate object in view is furtherance of the work on fowl paralysis (avian leukosis complex), incubator hygiene and the control of egg-borne diseases.

"Before making the grant," the announcement proceeds, "the Agricultural Research Council required an assurance from the Trust that its voluntary support from the poultry industry would be sufficient to maintain the Poultry Research Station in being. This assurance has been given and it is hoped that, inspired by the admirable support of the industry in Lancashire, which produced more than £1,300 for the Trust during 1951, other counties will give all the help in their power."

N.F.U. Support for the Trust

At the last annual general meeting of the National Farmers' Union, the General Purposes Committee welcomed the appointment of an Executive Committee of the Animal Health Trust, under the Chairmanship of Mr. J. Arthur Rank. Sir Richard Haddon is a member of this Committee, as is Mr. J. K. Knowles, General Secretary of the National Farmers' Union, while the other members are Mr. R. Bolton, Lord Stamp, Mr. H. Cole Tinsley and Dr. W. R. Wooldridge, Scientific Director and founder of the Trust.

The General Purposes Committee put forward the view, which was endorsed by the Council, that the Union should continue to give its support to the Trust as it had done continuously since its inception. It was stated also that the Union would be prepared at an appropriate time to give facilities for an appeal to be placed before the agricultural industry.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax:

Cheshire.—Roughwood Farm, Betchton, Sandbach (Feb. 21st).

Fifeshire.—Rathillet Farm, Cupar (Feb. 15th).

Herefords.—Public Abattoir, Stonebow Road, Hereford (Feb. 16th).

Lancs.—South Road Farm, Bretherton, Preston (Feb. 19th).

Wilts.—Torr Farm, Kington Street, Michael, Chippenham (Feb. 19th).

Yorks.—Lawns Lane, New Farnley, Leeds (Feb. 21st).

Foot-and-Mouth Disease:

Yorks (E.R.).—Rowling's Farm, Great Hatfield, Hull (Feb. 21st).

Fowl Pest:

Lancs.—Oswald House, Gill Lane, Longton, Preston (Feb. 21st).

Middlesex.—Grass Park House, Dollis Avenue, Finchley (Feb. 15th); Moorhouse Poultry Farm, Wood Lane, Stanmore, Middlesex (Feb. 17th).

Northumberland.—Minten Lane, North Shields (Feb. 19th).

Swine Fever:

Beds.—College Farm, Bourne End, Cranfield (Feb. 19th); Sowerby Avenue, Stopsley, Luton; Manor Farm, Lower Caldecote (Feb. 21st); Furzenhall Farm, Biggleswade (Feb. 22nd); Middle Field Road Farm, Sandy (Feb. 23rd).

Cambs.—Church Farm, Wendy (Feb. 20th).

Derbys.—Spring Farm, Hartshorne, Burton-on-Trent (Feb. 18th).

Lancs.—Red Cap Farm, Rishton; Carlton House, Main's Lane, Little Singleton (Feb. 21st); Moor House Farm, Belmont Road, Bolton; Toogood Farm, Toogood Lane, Wrightington, Wigan (Feb. 22nd).

Lothian (E).—The Dovecote, Haddington (Feb. 18th).

Norfolk.—Crossways Farm, Holme Hall, Thetford (Feb. 23rd).

Notts.—226, Nottingham Road,, Selston; Nazareth House, Priory Street, Lenton, Nottingham (Feb. 18th); 1, Francis Road, Carlton (Feb. 20th).

Oxon.—King's End Farm, Bicester (Feb. 20th).

Staffs.—93, Church Street, Blowick, Staffs (Feb. 18th); Niaina Poultry Farm, Aldridge Road, Streetly, Staffs (Feb. 19th).

Surrey.—Farleigh Court Road, Farleigh, Warlingham; Hamm Court Farm, Weybridge (Feb. 19th); 200, Godstone Road, Whyteleafe (Feb. 21st).

Warwicks.—Blount's Hole Farm, Trueman's Heath, Shirley, Birmingham (Feb. 19th); 705, Stoney Stanton Road, Coventry (Feb. 21st).

Worcs.—Jefferies Farm, Lower Bentley, Nr. Bromsgrove (Feb. 23rd).

Yorks (W.R.).—Old Run Road, Belle Isle, Leeds, 10.

OFFICIAL NEW AGENT IN RAT EXTERMINATION

The Ministry of Agriculture announces that, following four years' experiments and field tests, a new agent in the extermination of rats and mice is now available in a blood anti-coagulant, painless in operation, known as Warfarin ["3 (alpha-phenyl-beta-acetylethyl)-4-hydroxycoumarin]. The Ministry prescribes a formula for the use of Warfarin in two strengths, *i.e.*, a concentration of (*a*) 0·005 per cent. and (*b*) 0·025 per cent. Warfarin in baits for use (*a*) against common rats and (*b*) where ship rats or mice are present. It is required of the manufacturers that the Warfarin shall be produced in a master-mix containing (*a*) 0·1 per cent. and (*b*) 0·5 per cent. respectively by weight of Warfarin in fine oatmeal, or other approved material. This is to facilitate even distribution of poison in the final bait preparation which is made by the addition of one part (by weight) of the master-mix to 19 parts of medium oatmeal or other approved material. As the baits should remain in position for a number of days without disturbance they have to be laid in suitable containers to prevent scatter and loss.

"Where these conditions are observed it is established that Warfarin will be in the front rank in the process of rat-killing. Not only is the material in most cases equally effective with strong poisons which, for best results, require a course of prebaiting with plain food, but it involves much less risk to human beings, poultry and other stock from occasional accidental ingestion. It appears to be a painless killer of rats and mice, and could only be regarded in its low concentration as really harmful to people and livestock if taken repeatedly and in quantity over a number of successive days. That is most unlikely to happen with prudent baiting for rats and mice.

"In the case of strong poisons, the effect on rats of sub-lethal doses is to create a prejudice against the food in which the particular poison is contained. This fact has necessitated alternate use of different food bases and poisons where early repetitive treatment has been found necessary. As Warfarin does not appear to build up a similar prejudice in the animal, there seems no need to alternate with other poison baits, except where Warfarin, for some local reason, fails, in which case recourse to the other approved poisons is essential. It may well be that the conditions operating against the efficiency of Warfarin in particular surroundings are similarly to the disadvantage of other poisons. Such cases are not expected to be frequent, and when they do arise, they call for special treatment. Warfarin is not at present recommended for use in sewers.

"Warfarin is now being produced to the Ministry's specification by several suppliers."

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Student Health

Influence of Extra-curricular Activities

At a meeting of Medical Officers and others interested in Student Health convened by the Nuffield Foundation and held in Cambridge in July, 1951, the Medical Officer for Student Health Service in the University of Aberdeen read a paper on "The Extra-curricular Activities and their Influence on Student Health."

The information he supplied was based on 803 records in the years 1949-50 and 1950-51 respectively and was derived first from routine health examinations and secondly from the records of those students who attend for advice and treatment in respect of some disability. For the purposes of the investigation the extra-curricular activities recorded were exercise, participation in students' affairs, reading, interests inducing relaxation and activities in vacations. The following are extracts from the paper:—

In the case of medical students for whom the health examinations are compulsory, the results may be considered fully representative, but in the case of students of other faculties for whom the examinations are on a voluntary basis, the number represents only 20 per cent. of the Arts faculty and 30 per cent. of Science students.

With regard to physical exercise, 83 per cent. of all students examined stated that prior to coming to the University they had taken part in the various school games and other activities: 50 per cent. of them stated that on arrival they had given up all physical activities, both in the nature of organised games and other exercise. On being asked the reason 25 per cent. stated that they would like to take exercise and felt the better for it, but that they could not spare the time; 33 per cent. stated that they had no inclination or wish to take exercise, and of these a number also stated that they had not the time; 27 per cent. gave no reason.

Only 16 per cent. were found to be engaged in extra-curricular student affairs or taking an active part in the various clubs and societies. Perhaps the most striking feature of the analysis was the finding that 50 per cent. of all students examined stated that they did no reading at all other than that strictly associated with the curriculum. Of the remaining 50 per cent. only a small proportion were found to be reading classical literature or books of

cultural value. The reason given in every case was lack of time, many adding that already they had plenty of reading to do.

The most outstanding feature of the re-examinations was the small number of students who admitted to change of habit as noted at the first examination.

In regard to the relationship to academic performance 37 students graded on examination results as "exceptional" were compared with 33 regarded as "below standard" in that they had fallen back one year or more. The findings show a consistently higher percentage of activity in regard to the "exceptional" as compared with those "below standard."

Certain conclusions may reasonably be drawn from these records:—(1) A proportion of students at the University are living a totally unsuitable life. It cannot be said that those who spend the whole day in class rooms and their evenings at home or in lodgings, work for a large part of the week-end, who take no part in the activities of their fellows and who have no real interests outside of their work, are getting that wider, more liberal education which it is generally agreed that a University should provide, or one calculated to place them in a position to face post-graduate life. (2) Participation in extra-curricular activities does not militate against academic distinction. (3) A number of graduates who leave the University with distinction have in fact received an education which has been wholly or largely "within the confines of an examination syllabus." (4) The majority of students in the lower groups of academic performance are to be found in those who are both inactive and who appear to have no interests outside of their work.

The correlation of the findings with health has not been easy to determine on an exact basis since there is no yardstick by which health in an individual can be accurately measured. However, the results in two well-defined groups would seem to indicate that active participation in extra-curricular activities, particularly exercise in the fresh air, has a definite relationship not only to health but to a wider educational range and a higher academic performance. The relationship of health to exercise and the higher income groups is what one would have expected; the association with wider reading and academic performance is interesting.

Though the relationship seems to be well defined one has to consider carefully between cause and effect. Are students more active because they are healthy, or do they enjoy better physical health and freedom from mental disturbance because they find time to break away from the grind of book study and have other interests to which they can turn with release of tension?

There is no statistical answer to that question, but it seems only too clear that the mode of life which a far too high proportion of students are living during term, and the misuse by them of vacation, are not only causal factors in the loss of a great deal of what the University has to offer in a cultural sense, but are productive of a lower standard of physical and mental health than young people of this age group should enjoy.

A proportion of those coming to University have acquired through hereditary channels or have had implanted in them by more enlightened teachers, a sufficient degree of initiative to enable them to take stock of their new surroundings and adapt themselves to their new freedoms. These students constitute perhaps from 20 to 30 per cent. of new arrivals and are the leavening behind every student effort. The remainder less gifted with initiative find themselves at a loss, miss the supervision to which they had become accustomed at school, do nothing except what they are told to do by the University authorities and all too soon drop into a rut of extra-curricular inactivity from which it has been seen only a small number emerge in later years.

It has been shown that 75 per cent. of students are in receipt of educational grants at the bestowal of which the authorities make it clear that in the event of failure the grant will be stopped, so "work hard" is urged upon the student. There can be no doubt that this aspect of University life continues to be fully stressed but what prospective students often do not realise and what seems rarely to have been explained to them, is that the well defined course of study outlined in the syllabus is only part of what can be derived from a University education. The need for an outlook beyond the confines of the syllabus, for the development of human interests which can be gained only by contact with fellow students, not only class mates but those of other faculties and years and of different classes of society and nationality, by helping to administer student affairs and expressing themselves in public speech at debates, and for extensive reading outwith the curriculum, has not been stressed in the same way as the need for keeping abreast of a series of lectures. Indeed if this aspect of University life has been touched on at all it has usually been to point to the various extra-curricular activities as potential distractions to be resolutely set aside in the determination, by hook or crook, to pass the examinations as they fall due.

It is clear that a somewhat disturbing problem in regard to student health exists but the solution is not an easy one. In my view it would be unwise to take steps which would make the student unduly health conscious, and one certainly has no wish to undermine the resolution on the part of any individual to work hard, or his determination to pass examinations at the prescribed time. It is only by hard work that the average student can succeed, but it would appear that many of the younger people coming to University have no idea how to go about the business of learning or how to apply their energies to the best advantage. Their devotion to the subject matter of the curriculum and the self abnegation which many practise have far too often defeated their own object.

It seems, therefore, that advice to prospective students as to how to conduct their lives generally is necessary. This should start at the school period by giving equal prominence to all aspects of University life. This advice should be followed on arrival at the University by an authoritative talk from the Vice-Chancellor or Principal, or a senior member of the staff, in which the value of extra-curricular activities is explained and participation in them encouraged For the less resourceful a more definite form of guidance would probably be necessary. This could be achieved through the appointment of an individual, who might be termed a Welfare Officer, to whom all students would be required to report as soon after arrival as possible. Those lacking initiative who would otherwise fall into unduly sedentary habits might be directed to a more active, healthy and worth-while way of living

Finally, in regard to the factor so frequently put forward as a reason for extra-curricular inactivity, I would like to urge, so far as one may do so from the health point of view, an easing of the curriculum wherever this may be found possible.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

"STRICTURE OF THE OESOPHAGUS OF THE DOG"

Sir,—The clinical communication "Stricture of the Oesophagus of the Dog," by Mr. L. R. Geffen (*Vet. Rec.*, January 12th, 1952) details two cases typical of *Spirocerca lupi* infestation of the oesophageal wall, a common condition in tropical and sub-tropical zones. The life cycle is through an intermediate host—a coprophagous beetle—and a transport host—frogs, snakes, lizards and numerous birds and mammals—to the dog. Larval migrations cause stricture and aneurysms in the gastric and gastro-epiploic arteries, the upper abdominal and lower thoracic portions of the aorta, and the oesophageal wall, sometimes with tumour formation in the last site.

No specific treatment is known. Prevention consists of stopping ingestion of the intermediate or transport hosts.—Yours faithfully, G. V. Short, 18, Strand Road, Calcutta. *February 13th*, 1952

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OEDEMA DISEASE IN SWINE

Sir,—I was very pleased when I saw the reports in your issues of February 2nd and 16th, from Mr. R. J. A. Swift and Mr. Walter B. Forrest, concerning oedema disease in swine, and its successful treatment with vitamin B_1. At the annual general meeting of the Norwegian Veterinary Medical Association in Oslo, August 31st, 1951, I read a paper on gut oedema in pigs. (Printed in *Maanedskrift for Dyrlaeger*, Vol. LXII, 1951. p. 224 and p. 278). Here is the summary in English:—

Grisedauen (English: Gut Oedema) in the pig was observed in Norway during the first years of World War II. The disease has not been recognised in other Scandinavian countries (Sweden and Denmark). The majority of outbreaks occur from August to January. Without treatment the mortality rate in affected litters is 50 to 70 per cent., exceptionally 100 per cent.

The usual symptoms of the disease, with oedema in the eye-lids and bowels and paralysis and death within 5 to 24 hours, are described. I then describe a method by which I think the disease can be prevented.

For the last two years I have used, with good results, phthalylsulphathiazole in the food and subcutaneous injection of B_1 vitamin.

I give each unaffected pig in all affected litters a subcutaneous injection of 75 mg. B_1 vitamin (aneurin hydrochloride). In the food each pig (two to three months old) gets 3 grammes of phthalylsulphathiazole twice a day for two to three days. With this treatment it is only in exceptional outbreaks that the disease will not stop at once.

XUM

If, in spite of this treatment, the disease should persist in the litter, then I give the affected pigs 6 to 10 grammes of phthalylsulphathiazole in one dose and 3 grammes twice a day for some days more, and nearly all of them will recover.

My experience is that if a pig gets the disease one or two days *after* it has been treated with B_1 vitamin and phthalylsulphathiazole, it is only in exceptional cases that recovery does not follow.

I believe the disease is due to an unknown virus or bacterium and that toxins destroy the B vitamin in the digestive organs.—Yours faithfully, JOHANNES AUSTVOLL, Stavanger, Norway. *February 18th*, 1952.

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TRIALS WITH A SHEEP DIP CONTAINING BOTH DDT AND BENZENE HEXACHLORIDE IN MICRO-CRYSTALLINE FORM

Sir,—The value of dips containing DDT in protecting sheep against blowfly "strikes" (*i.e.*, the consequence of oviposition by *Lucilia sericata* and other blowflies) was clearly demonstrated in the series of trials conducted by Hughes and his colleagues at Aberystwyth (Hughes, Jenkins & Jones, 1946; Hughes, Pollard, Field & Jones, 1947), who recorded that DDT was far superior to either benzene hexachloride (BHC) or arsenic. These workers found that although dips containing a dispersible preparation of DDT would not afford protection against "tail strikes" or "crutch strikes" in dirty sheep, *i.e.*, those in which there was contamination with faecal material as a result of scouring, they reduced the incidence of strikes in other animals to almost negligible proportions over a period of several weeks. In their second series of trials, involving three groups of approximately 1,000 sheep each, there was in the period of 33 days after dipping a strike rate of only 0·5 per cent. in the DDT group, compared with 6·6 per cent. in the benzene hexachloride group and 8·1 per cent. in the arsenic group.

During the course of their work Hughes and his colleagues found evidence of a reduced number of strikes in undipped control sheep running with a group of sheep dipped in DDT. The observed strikes in these undipped controls were considerably fewer than in sheep on neighbouring farms. Similar observations were made in Queensland by Johnstone and Scott (1951). These findings indicate that it is difficult to evaluate the efficiency of a dip containing DDT by comparing the results with those in untreated control sheep in the same flock, and Johnstone and Scott have suggested that the only solution would be to run some untreated sheep with, and others away from, treated sheep on the same farm.

Recently it has proved possible to formulate sprays and dips incorporating DDT in the form of micro-crystalline pastes. Emery (1951) has reviewed the properties of these pastes and the stability of suspensions containing them, and work from his laboratories has indicated that, in the case of plant pests, the micro-crystalline form is more toxic to insects than the amorphous form and has a greater duration of action.

Most suspension dips are made by grinding DDT and BHC with kaolin and an emulsifier to an extremely fine state of subdivision. It is now possible to manufacture dips by heating DDT and BHC with a lignin sulphonic acid emulsifying agent until molten, and pouring into water under controlled conditions of temperature and agitation. This produces micro-crystals of DDT and BHC, and the dip when suitably diluted shows a marked stability on standing, so far as sedimentation of the particles is concerned. Microscopic examination of the diluted dip reveals long needle-shaped micro-crystals of DDT, in contrast to the usual suspension dip in which the DDT particles occur as broken portions of much larger crystals.

The value of a dip containing DDT and BHC in micro-crystalline form has been tested during the summer of 1951 in some combined spraying and dipping trials with flocks of sheep in the counties of Kent, Northampton and Somerset. These trials were made possible through the co-operation of Messrs. J. D. Blaxter, M.R.C.V.S., P. S. Hastie, M.R.C.V.S., and G. S. Peyton, M.R.C.V.S., to whom and to their farmer clients thanks are due. The formulation employed was as follows:—

DDT	40·0 % *W/W*
BHC (*gamma* isomer)	2·6
BHC (other isomers)	0·1
Sulphite lye emulsifier	18·6
Kaolin	2·7
Water	36·0

Traces of sodium pentachlorphenate were included to prevent mould growth, and since this compound has been found to be active *in vitro* against *Erysipelothrix rhusiopathiae* it may be of value in future in preventing infection with this organism at dipping. For the trials, however, 0·03 per cent. of copper sulphate was added to the contents of the bath. This formulation above was diluted at the rate of 5 lb. per 100 gallons water, so that the dipping bath contained 0·013 per cent. gamma-BHC and 0·20 per cent. DDT.

In all, over 5,000 sheep at 11 farms were dipped, but since one farmer failed to keep adequate records his results have been deleted. Some farmers left a proportion of animals undipped until late in the statutory period, but in view of the above-mentioned findings of Hughes and his colleagues and those of Johnstone and Scott, it is preferable to refer to them as "undipped sheep" rather than as controls. In most instances these animals appeared to benefit from their contact with dipped sheep, although in one instance—Farm C—strikes occurred in the undipped sheep whereas the dipped animals were unaffected. Daily records were kept by the farmers for a period of 42 days after dipping. The incidence of strikes may be summarised as follows: minor "tail strikes" in dirty lambs have been disregarded.

Farm	*No. of sheep dipped*	*First strike (days after dipping)*	*Percentage struck within 42 days of dipping*
A (Kent)	1,500	56	*nil*
B (Kent)	600	40	0·17
C (Kent)	120	—	*nil*
D (Kent)	700	35	0·71
E (Northants)	520	—	*nil*
F (Northants)	150	42	1·34
G (Northants)	90	57	*nil*
H (Somerset)	451	14	5·56
I (Somerset)	140	31	2·15
J (Somerset)	250	60	*nil*

The results obtained at Farm H call for comment. This was the only instance in which more than one owner dipped his sheep in the same bath, and the 451 animals represented small contingents of 115, 33, 60, 96, 45 and 102 from six different farms. All the strikes occurred in the group of 115 that was put through the bath first. The remaining 336 remained free from attack.

On the basis of these observations, and of the accompanying chemical data, a dip containing DDT and BHC in micro-crystalline form would appear to be efficient in the control of blowfly attack. The above formula has been modified in the light of the experience gained during the past season, and will be tested further during 1952. A more detailed report of the 1951 trials, and of the associated chemical data, will be published elsewhere.—Yours faithfully, ALASTAIR N. WORDEN, Cromwell House, Huntingdon, and A. F. McK. JACKSON, Walter Gregory & Co., Wellington, Somerset. *February 19th*, 1952.

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SODIUM PROPIONATE IN VETERINARY THERAPEUTICS

Sir,—Mr. S. J. Tucker's interesting communication on sodium propionate in veterinary therapeutics (*Vet. Rec.*, February 16th, 1952) brought to mind work in this field in which we were engaged about six years ago. It had always appeared anomalous to us that whereas industrial fungicides such as sodium propionate, salicylanilide, etc., were more or less completely effective in dealing with mould growths in butter boxes, cheese containers, and so on, considerable difficulty was encountered in the therapy of dermophytosis in both man and animals. At our Butterwick Laboratories, a full *in vitro* examination was made of numerous known and speculative fungicidal substances against a wide range of test organisms. The results showed that large numbers of substances, including sodium propionate, were active in high dilution, but unfortunately *in vivo* tests did not usually give parallel effects. This was especially so in animal mycosis. Keeney, Ajello and Lankford (*British Medical Journal*, September 8th, 1945) made various field tests in man and reported good preliminary results in epidermophytosis ("athlete's foot") with a complex ointment of propionate—propionic acid in propylene glycol and a carbowax base. Despite this, wide usage of sodium propionate has not followed since general experience has been that even in this condition it is at best only partly effective. In scalp ringworm sodium propionate has never proved sufficiently active to be widely used.

Fungus infections of areas of skin carrying hairs or fur are characterised by deep invasion of the hair follicles and it may well be that the problem of their therapy is related to the penetrative powers of the medicaments used. Certainly much fuller investigation of this aspect is required.—Yours faithfully, D. D. OGILVIE, Imperial Chemical (Pharmaceuticals) Limited, Fulshaw Hall, Wilmslow, Manchester. *February 18th*, 1952.